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The spread of the excitatory process in the toad's ventricle.

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The toad's ventricle has been examined by two methods (1) by charting the arrival of the excitatory process at various surface points and at certain points in the interior of the ventricle ; (2) by calculating the electrical axis and studying its movements during the initial stages of systole.

As in the mammalian heart, the excitatory process spreads in the toad's heart from within outwards. Direct readings show that the lining of the ventricular cavity is first activated in the region of the A.-V. ring, later readings are obtained from other parts of the lining ; the latest readings are taken from the external surface. Surface readings show that the central region of the muscle is first activated externally and the base and apex later and almost simultaneously. In toads' hearts which show an *S* deflection in axial (extracardial) leads, the base of the ventricle is the last to be activated ; where there is no *S*, the apex is last.

The electrical axis, while the whole of the chief deflection *R* is inscribed, forms an almost constant angle of about 90° with the horizontal. That is to say, the excitation wave passes on the average in a base-apex direction. If an *S* deflection terminates the initial phases, then the angle abruptly changes to -90° , showing that the average direction in which the excitation wave progresses has altered to an apex-base direction.

The surface and lining readings cover the whole period of the initial phases (*R* and *S*) of the axial electrocardiogram. These phases, therefore, correspond to the activation of the muscle.

Briefly, the excitation wave in the toad's heart commences at the ring and passes directly downwards in the processes of ventricular muscle which spread radially in the interior of the ventricle to the apical and central region. It also spreads towards the base along a curved path which eventually is directed upward. The paths to apex

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and base are sometimes of equal length, but more usually the path to the base appears to be the longer.

Thus although the general direction of travel is a base-apex direction over the greater part of the period of activation (corresponding to R); nevertheless the basal muscle at the surface is usually activated later than the apical muscle at the surface, and is responsible for the last initial deflection S .

There are weighty objections to the earlier interpretations of curves from base-apex leads, where the contacts of these leads lie in immediate contact with the ventricular muscle.

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